

# A CITY SCAN FOR THE HUNTER AND CENTRAL COAST

## CIRCULAR ECONOMY - CITY SCAN EXECUTIVE SUMMARY

In collaboration with -





## ACKNOWLEDGEMENT OF COUNTRY

We remember and respect  
the Ancestors who cared for  
and nurtured this Country.  
*Dhumaan ngayin ngarrakalu  
kirraanan barayidin.*

It is in their footsteps that we  
travel these lands and waters.  
*Ngarrakalumba yuludaka  
bibayilin barayida baaduka.*

Lake Macquarie City Council  
acknowledges the Awabakal  
people and Elders past,  
present and future.  
*Lake Macquarie City Council  
dhumaan Awabakala  
ngarrakal yalawaa, yalawan,  
yalawanan.*

Wording by the Aboriginal Reference Group  
and translated by Miromaa Aboriginal  
Language and Technology Centre.

## ACKNOWLEDGEMENTS:

This 'City Scan' effort results from collaboration and cooperation involving a number of organisations in the Hunter and Central Coast region.

The funding partners have been Lake Macquarie City Council, the Hunter Joint Organisation, the City of Newcastle, Central Coast Council and the non-profit consultancy, Go Circular. Funding was also provided by the Australian federal government's Australian Postgraduate Research Intern Program (APR Intern), supporting the work of the project's data researcher, Mr Kyle Stevens. Additional support has been provided by Sustainability Advantage of the NSW Department of Planning, Industry and Environment as well as by the consultancy, Environmental Resilience Planning, Dr Anumitra Mirti, principal.

The *City Scan* approach and interactive web tool were developed by Circle Economy, a Netherlands-based consultancy that also provided ongoing guidance in use of the tool. The method was applied to the Hunter and Central Coast region and additional research was completed by a team from the University of Newcastle, coordinated by the Hunter Research Foundation Centre.

The research process included interviews of one or more individuals from each of the following industry and government organisations - Ampcontrol, CSIRO, Dantia, Emergent Group (formerly Advitech Group), Hunter Water, Kumalie Group, Lake Macquarie City Council, Net Modular, Orica, Port of Newcastle and Quarry Mining. Over 100 additional individuals from more than 70 organisations were engaged with preliminary findings in a circular economy 'think tank' at the Hunter Innovation Festival.

## KEY LESSONS

### Set priorities

The *City Scan* process of seeking, assessing and collating economic and environmental data highlighted certain priorities. Phase 1 of a *City Scan* suggests prioritising the manufacturing sector in the region rather than the IT sector, for example. However, as it is still early days in adapting the *City Scan* to the Australian context, higher order priorities were identified.

### Build collaboration

Accelerating development of the region's circular economy requires collaboration across government and industry sectors. The circular economy involves a wide array of players with an equally wide array of interests and goals. However, certain common goals exist, as well, and 'collective impact' can be achieved through stronger, collaborative working relationships, particularly among sectors that may not have worked together much before.

### Improve data and understanding

This collaborative alignment is needed to yield better data and better understanding of the potential and opportunities offered by the circular economy. Collaboration is also needed to build new working relationships, which are essential to facilitate a more 'circular' marketplace for goods, materials, energy and water.

#### IDENTIFY DESIRED ENVIRONMENT-ECONOMY 'WINS'

Business, government and community in the region need to collectively discuss the *City Scan* phase 1 results and agree on what near-term outcomes from circular economy initiatives would count as a 'win'. That will determine which industry sub-sectors deserve attention and support for circular strategies.

#### STRENGTHEN COLLABORATION BETWEEN BUSINESS, GOVERNMENT AND COMMUNITY

Better data can be gained by government engagement with the business sector - as businesses become more attuned to reporting scope 1, 2 and 3 emissions. Also needed is joint pursuit of a carefully planned regional data strategy that can adapt as technology and data availability increase.

#### ESTABLISH A REGIONAL DATA STRATEGY

Selecting which types of businesses can be assisted in becoming more circular, and which 'circular' strategies to employ, requires much better data on material consumption and greenhouse gas emissions of the region's businesses. So, building the region's circular economy necessitates strengthening the knowledge economy.

# ACCELERATING THE CIRCULAR ECONOMY

## A City Scan for the Hunter and Central Coast

### 1. Circular economy – Important today

**Window of opportunity** - The Hunter and Central Coast region has the opportunity to become home to Australia’s leading regional circular economy. That is due to the rapid rise in interest in the circular economy in Australia and recent commitment by the NSW and federal governments to achieving net zero carbon emissions by 2050. The net zero target provides a threat to the region’s carbon-emitting industries but also an opportunity to shift use of its skill sets and infrastructure.

**Connecting the dots for this region** - This report addresses the opportunities and hurdles related to developing the region’s circular economy. It summarises insights from collation and analysis of data on the economy, consumption of materials and greenhouse gas emissions in 10 overarching industry sectors in the 10 local government areas (LGAs) of the Hunter and Central Coast region. It draws on stakeholder input and international experiences to highlight industry sectors worth more attention and to identify next steps. These steps involve cross-sector collaboration and creation of a regional data strategy.

**Growing interest** - The overall aim of the circular economy is to reduce the typical, once-through use of materials - ‘take-make-waste’ - in our products and services. Designing out waste, keeping materials and resources in use at their highest and best value, and regenerating natural systems will benefit from new strategies in procurement, planning and operations as well as new business models.<sup>1</sup>

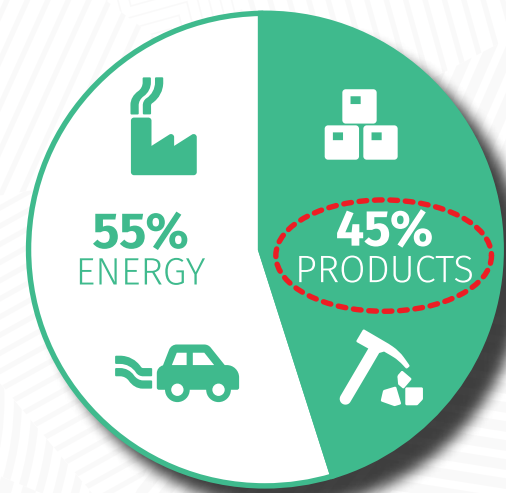
**Reducing greenhouse gas emissions** - Attention paid to the circular economy has climbed dramatically since 2015, especially in Europe and China. The impact was felt here in 2018 when China stopped importing Australia’s recycled materials. That has increased pressure on landfills and recycling systems but so has interest in the implications of material use for greenhouse gas emissions. Net zero carbon emissions by 2050 has been adopted as an aspiration by both the NSW government and the federal government. In June 2021, the state government issued its *Waste and Sustainable Materials Strategy 2041: Stage 1: 2021-2027* - a 44-page document that refers to the circular economy 104 times. That is because the use and disposal of materials - aluminium, glass, paper, concrete, etc. - is responsible for nearly half of greenhouse gas emissions (see Figure 1).

**Business attraction** - Reducing waste and using one industry’s waste stream as another’s feedstock fit hand-in-glove with a smart specialisation strategy for regional economic development. Smart specialisation implies diversifying the economy into areas that build on strengths in workforce skills and existing infrastructure, such as power transmission lines and transport facilities. Circular economy adds the focus on smart use and reuse of materials across a region’s industries, creating new supply chain linkages and reducing costs. By aligning with tenets of smart specialisation, the circular economy promises a combination of business attraction, jobs growth, waste reduction and lower greenhouse gas emissions.

**Regional scale** - The region needs an evidence-based, collaborative effort involving varied industry sectors, government and community. Providing that evidence base necessitates closing significant gaps in data on material consumption and greenhouse gas emissions at the regional scale. The regional scale is essential for the circular economy as a region is sufficiently large to offer economies of scale. It is also sufficiently small that the cost of transporting a ‘waste’ product or material with low value (such as an old mattress) to a site of reuse or recycling remains economical.

**Details in the full report** – This report provides highlights from an 80-document detailing the data, methods and outcomes from this initial stage of a *City Scan* analysis. For each point provided in this document, explanations and references are cited in the main report.

### TOTAL CURRENT EMISSIONS



**Figure 1. Products and materials are estimated to account for 45% of greenhouse gas emissions globally.**

**Source: Ellen MacArthur Foundation**

# CIRCULAR ECONOMY STRATEGIES

**Core strategies** - The consultancy that developed the *City Scan* methodology, Circle Economy, has identified a set of what they refer to as 'core' circular economy strategies in three general domains:

- 1) use waste as a resource;
- 2) stretch the lifetime; and
- 3) prioritise regenerative resources.

**Enabling strategies** - They also identify 'enabling' strategies under another five headings:

- 4) strengthen and advance knowledge;
- 5) rethink the business model;
- 6) design for the future;
- 7) incorporate digital technology; and
- 8) team up to create joint value.

**Specific strategies** - Under each of these headings are 2, 3, or 4 sub-headings, which results in 25 specific types of strategies.

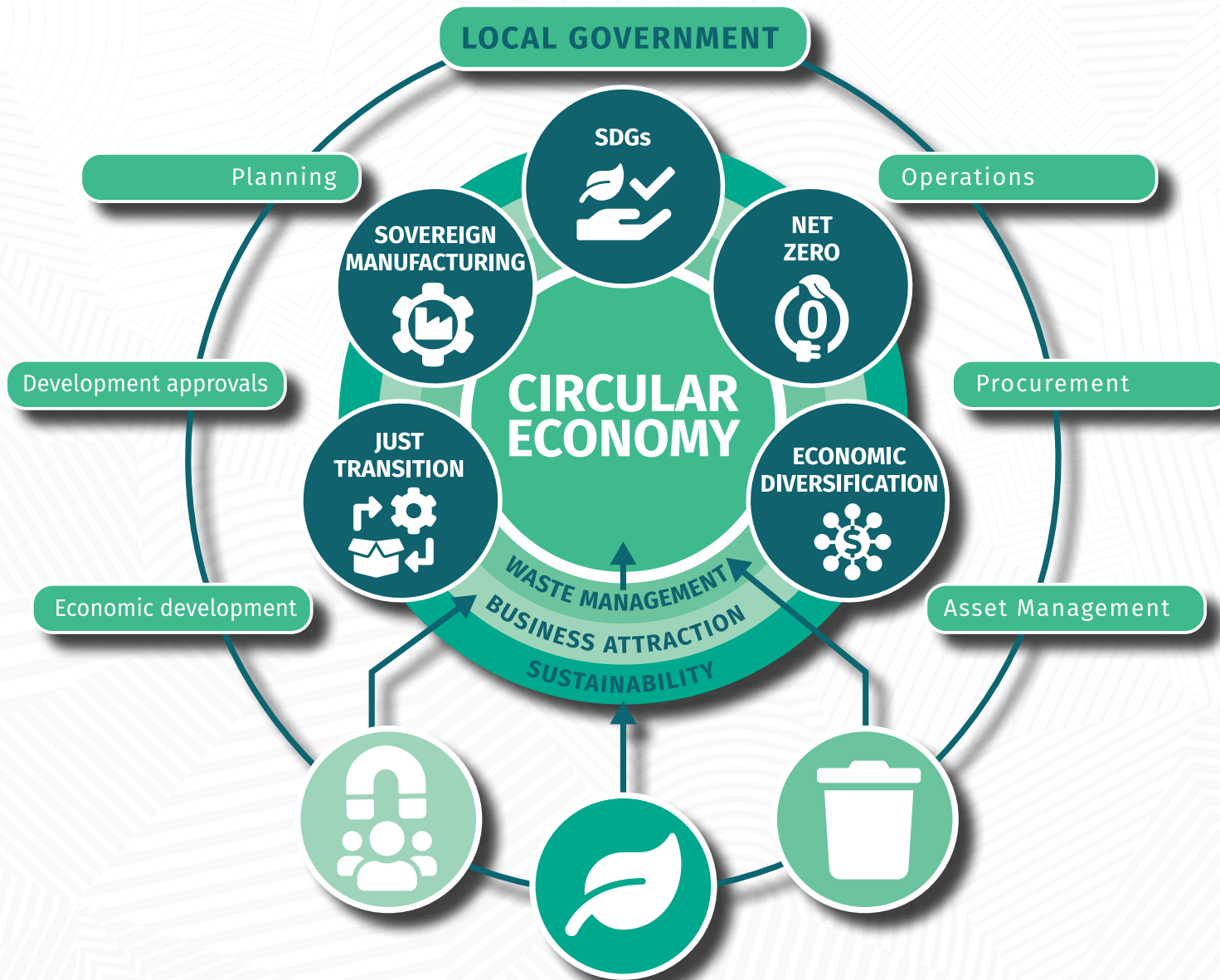
The *City Scan* tool with the input data provided on the Hunter and Central Coast region yielded high ratings across the 10 industry sectors for circular economy strategies of:

- recycling within an industry sector,
- industry collaboration,
- energy efficiency and use of renewables,
- energy recovery from waste,
- designing out waste and
- recycling waste with other industries.

## ***Circular economy is not a single end state –***

The circular economy does not represent a single end state, e.g., where 80% of products are recycled, cars are all electric and people wear solar panels to recharge their phones. Rather, it represents an array of approaches to using materials, energy, water and land.

Figure 2. Adopting a CE addresses other critical business drivers and opportunities for Local government



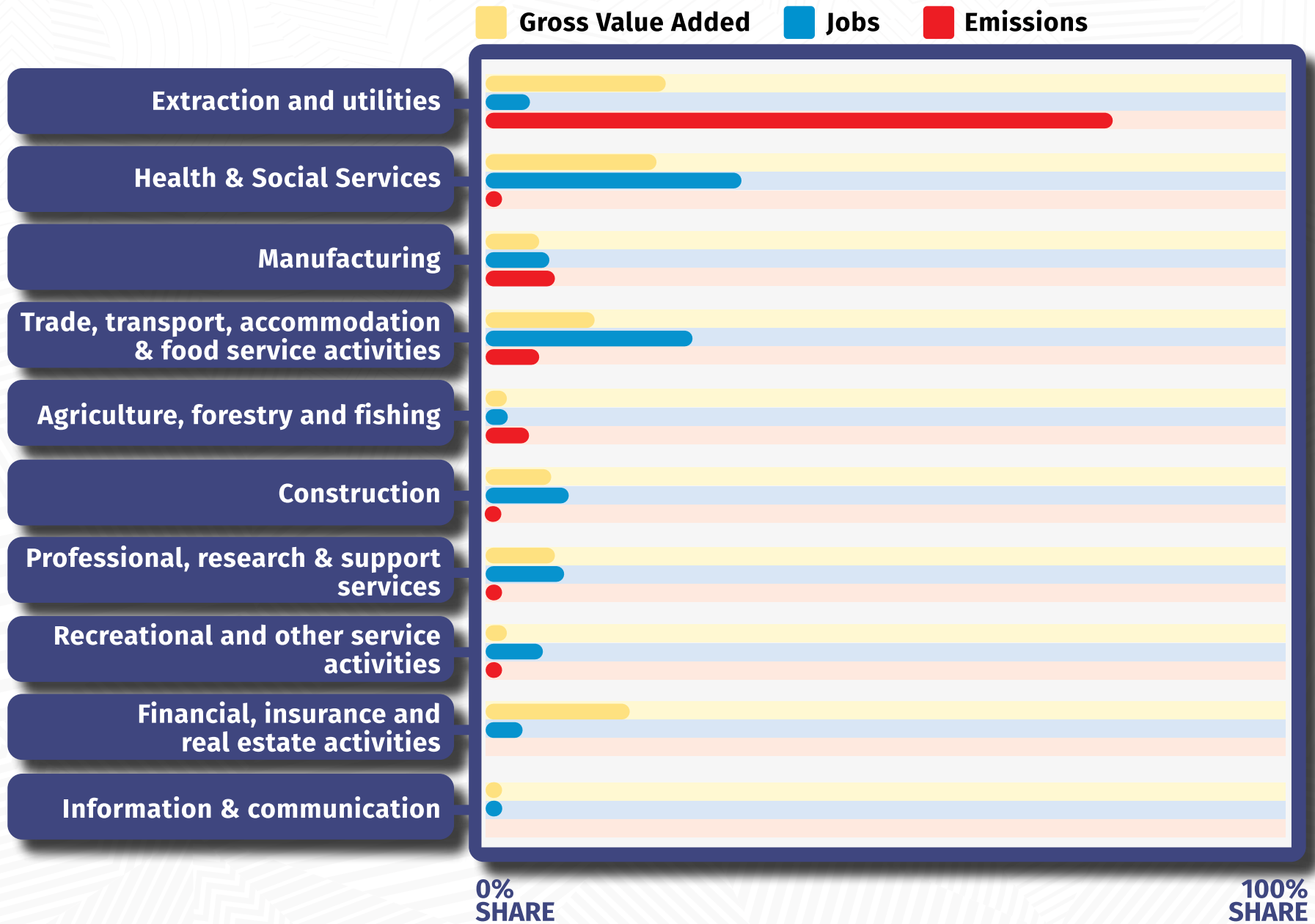
## 2. Lessons learned

This phase 1 *City Scan* effort built working relationships, identified key gaps in data, and provided valuable insights. Big picture messages include:

- a) **Environment-economy tensions are rising** – The data gathered to date, despite its uncertainties, reveals which industry sectors dominate greenhouse gas emissions in the region and what the economic value of these sectors is. This data suggests how many jobs might be at stake as measures to reduce carbon emissions become stronger. For example, jobs in the steel industry in China can be seen to be at risk (and jobs in iron ore mining in Australia) as production has recently been curtailed, ostensibly to help reach targets for greenhouse gas emissions. So, by reducing greenhouse gas emissions, circular economy strategies can help to avert disruptions in supply chains, such as what is being felt currently due to COVID-19 shutdowns, and avert job losses.
- b) **Data challenges require collaboration** – Challenges in obtaining credible and consistent data on material consumption, the makeup of the waste stream, and greenhouse gas emissions at the city and regional scale face any local government in attempting to assess the circular economy potential of its LGA or region. The scarcity of data at a regional scale underlines the importance of triangulating among data sources. It also highlights the need for governments to work with businesses and consultancies in the region who have data on the material inputs, energy and waste of local facilities and operations.
- c) **The circular economy arena internationally is growing to include Australia** - International and national experts on the circular economy provided a great reality check on the quality of data available for this regional analysis. Their willingness to engage with our region suggests –
  - their interest and support for growing circular economy initiatives,
  - the timeliness of this project, and
  - the importance of the regional scale – and regional collaboration - for the circular economy.



Figure 3. Proportion of emissions and economic benefits by industry sector in the region. Source: City Scan tool





## Economic gains or losses from a circular economy?

Will the circular economy reduce or increase GDP and employment? This question arises because the circular economy has a focus on reducing consumption, *e.g.*, people purchase fewer TV sets and businesses purchase less furniture. Less purchasing would require fewer retail outlets and fewer distributors. Lower demand also means less need for factories, which can lead to less employment in manufacturing. So, if a consumer keeps their TV set for 15 years instead of 10 years, will the bottom fall out of the economy?

That is not the conclusion of analyses of a range of regions and countries, which suggests that the circular economy offers economic stability if not growth compared to continuing with 'business as usual'. The following studies indicate that increased economic activity and employment in redesign, reuse, recycling and renewable energy will more than offset jobs lost in manufacturing. The modelling results do vary, but the economic outcomes from creating a more circular economy look positive.

*Journal of Cleaner Production* – 'Macroeconomic, social and environmental impacts of a circular economy up to 2050': Overview of 27 academic studies assessing 300 circular economy scenarios in various parts of the world. Median figures for 2030 – 25% reduction in greenhouse gas emissions, 1.6% rise in employment, 2% rise in GDP.

KPMG and CSIRO – *Potential Economic Payoff of a Circular Economy: Australia's GDP gains \$96 billion* by 2048 from improved building efficiency alone and **\$30 billion** just from reduced leakage in the water system.

PwC – *Building a more circular Australia: Australia can gain \$1,860 billion* in direct economic benefits over the next 20 years, with **\$648 billion** of that in New South Wales, averaging 3.5% of the state's contribution to the GDP.

South Australia - *Creating Value: 21,000 jobs* added by 2030 through increased efficiency in using materials, half professional and half trades and services.

New South Wales – *The Circular Economy Opportunity in NSW: Australia's GDP in 2048 is \$210 billion* higher, with up to **50,000 jobs** gained in NSW by 2025; **3.3 jobs** in recycling for every **1 job** lost in landfill disposal.

Beyond Zero Emissions – *Million Jobs Plan: The Hunter region gains 10,000+ jobs* by 2030 through new forms of manufacturing and energy services.

Grattan Institute – *Start with Steel: The Hunter region gains 10,000 jobs* through the manufacture of 'green' steel.

Hunter Community Environment Centre – *Jobs and Growth: Fly ash from power stations that is used in aggregate for construction could support 3,000 jobs* state-wide and add **\$1 billion** to the GDP.

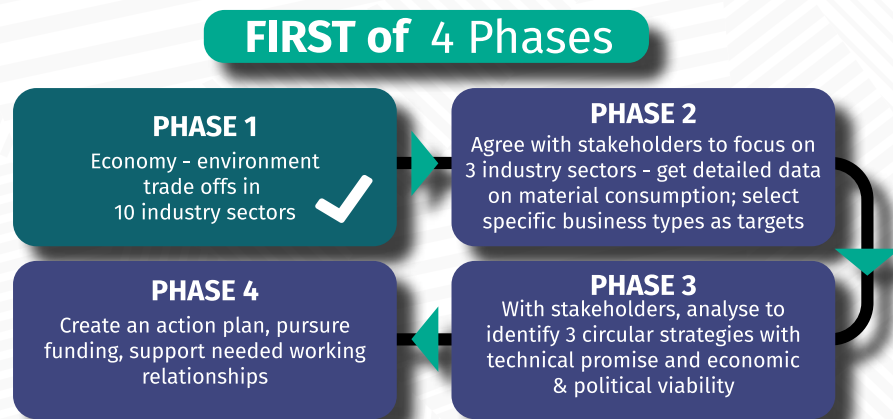
*full citations for these references are listed at the end of this document*

### 3. Project methodology

**Intent of the research** - This research was motivated by a need gain greater understanding of the circular economy opportunities in the region. It was conceived to help prioritise where efforts by local government and business should be focused. It has also been a vehicle to cultivate greater collaboration across local governments and with businesses. This resulting summary and the accompanying longer report are meant to bolster comprehension in the region of the circular economy and its potential.

**Evidence base** - This project focused on providing an evidence base to guide decisions on how to accelerate development of the circular economy in the Hunter and Central Coast region. The methodology selected was a 'City Scan', developed by the prominent Netherlands-based consultancy, Circle Economy. The project team piloted their online tools, providing their first use in Australia.

**First of four phases** - According to Circle Economy, a full regional analysis leading to development and implementation of action plans involves four phases. The *City Scan* effort reported here constitutes phase 1 – establishment of baseline figures identifying which sectors of the economy are largest and which ones have the greatest environmental impact. Subsequent phases engage stakeholders to narrow the focus, envision possibilities and converge on action plans. That involves collecting more detailed data and assessing which specific businesses are most amenable economically, technically and politically to adopt one or more of an array of circular strategies and business models.



**Sets priorities** - This phase 1 of the *City Scan* method enables local government policymakers to set priorities for developing the circular economy in their region. It helps businesses and other organisations to identify circular economy opportunities. Are the bigger wins for greenhouse gas reductions in this region from addressing organic waste in the restaurant sector or from recovering legacy fly ash around the coal-fired power stations that generate 40% of the state's electricity?

**Good data is not always available** - Economic data is readily available to identify levels of employment and contributions of various industry sectors (such as construction or social services) to Australia's GDP. Data was also needed on material consumption (e.g., steel, food crops, concrete, plastic) and greenhouse gas emissions for each of ten, overarching industry sectors. Credible data on emissions and material consumption at the level of LGA and industry sector has proven hard to assemble. The lack of high-quality data on material consumption and emissions is recognised among international experts as a challenge.

**City Scan does not yet cover ...** - Phase 1 of the *City Scan* analysis does not use as input any figures on waste or recycling tonnage, volumes of water used, or energy consumption. It does not generate a figure for the level of 'circularity' in the region's economy presently or what level could be achieved by implementing specific measures. Tools for assessing circularity at the firm level and city or regional level are beginning to emerge internationally.

*City Scan* also does not cover scope 3 (supply chain) greenhouse gas emissions. No ways to estimate scope 3 emissions are widely considered to be credible and accurate, given the complexity involved in tracking emissions across a supply chain.

Additionally, the *City Scan* process focuses just on commercial and industrial sectors, not on residences. That is consistent with the notion that residential consumption of materials tends to occur through businesses in the region. Additionally, residential waste accounts for only about 20 per cent of total waste tonnage in Australia.

**Boost 'circular literacy'** – The consultancy team at Circle Economy recommend that the online tool – <https://cities.circlelab.com> – containing data on 'Newcastle, Lake Macquarie, the Hunter and the Central Coast' be made generally available. The tool reveals input data and output recommendations, which can boost engagement and understanding of the trade-offs and opportunities for the region's circular economy.

**Not just recycling** - The circular economy is about much more than recycling. Elements include designing out waste so as to use materials more wisely. They also include new business models – such as leasing equipment rather than purchasing it in order to give that equipment high levels of use. For example, it is best to avoid having an unused exercise bicycle gathering dust in one person’s garage while their neighbour or a gym down the street purchases new exercise equipment.

**Constant consumption** - The level of waste generated per capita in Australia has changed little in the past 20 years, according to the federal government’s *National Waste Report 2020*. Household recycling has climbed modestly, but the volume of material purchased and consumed has barely shifted. The level of recycling of construction material has climbed significantly, though.

**Economy and emissions** - Statistics show a high correlation between economic output and greenhouse gas emissions. As the national population and economy have grown, greenhouse gas emissions have increased.

#### 4. Better data is needed

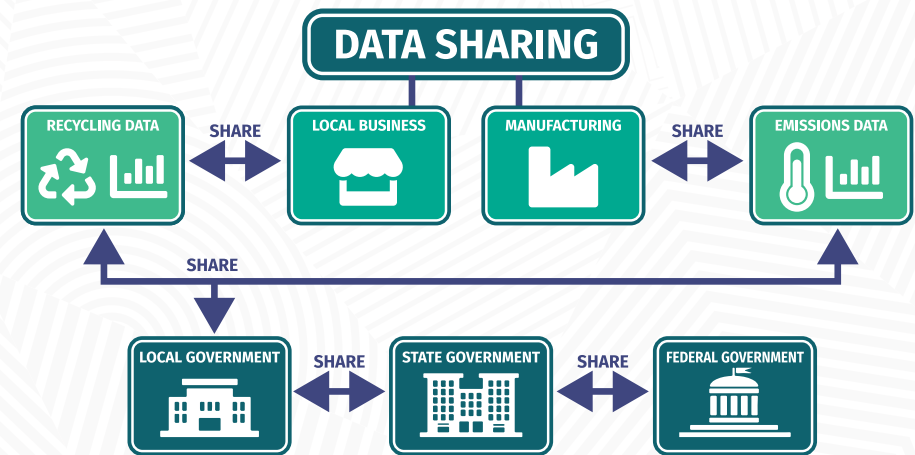
**Today’s data is okay for setting initial priorities, but not assessing progress**

- The data on materials and emissions currently available has proven useful for phase 1 of the *City Scan* analysis, identifying which overarching industry sectors are worth greater attention. However, the data contains high levels of uncertainty, which make it less useful in tracking progress of circular economy initiatives from year to year. That tracking is critical for identifying which efforts to boost the circular economy, and reduce greenhouse gas emissions, are actually having a significant effect. It is also necessary to gauge whether overall progress is quick enough to reach a goal of net zero carbon emissions by the year 2050.

**Better data can attract suitable businesses** - High levels of uncertainty make it difficult to compare one region with another. That is important not just for benchmarking to assess progress but for business attraction. A company seeking to take advantage of circular economy synergies across industries would look to see ‘where the action is’. For example, can they obtain reliable figures for annual availability of aluminium scrap or window glass, which they could use in their production process in place of more costly virgin materials?

**More about this issue** - These data issues are expanded on for the lay reader in this document’s [Appendix](#).

**Importance of sharing data among local businesses, manufacturers, and all levels of government.**



**Table 1. Data gaps and how to remedy them – summary**

<b>TYPE OF GAP</b>	<b>PREVENTS</b>	<b>TYPE OF EXAMPLE</b>	<b>REMEDY - OPTION</b>
<b>1. Too little</b>	Tracking effectiveness of circular economy strategies	Little data on material consumption; cannot balance with data on tonnage of materials in waste stream.	Start small - collect data from a few committed businesses
<b>2. Too much</b>	Collating data to fill gaps (see 1)	Large companies estimate and report greenhouses gas emissions, material use; need to collect it from each one.	Start small - collect data from a few committed businesses
<b>3. Innaccurate</b>	Tracking progress in reducing GHGs	Greenhouse gas emissions (GHG) are estimated depending on the industrial precesses used & the amount of economic activity. Not measured.	Improve models for assessing GHGs
<b>4. Too complex</b>	Identifying which companies can make the biggest difference in reducing consumption, reusing, recycling	GHGs in scope 3 are generated by vendors outside a given region, but the company in the region might have some influence to shift those processes or practices.	Improve international protocols for assessing and allocating responsibility for GHGs, material consumption
<b>5. Commercial in confidence</b>	Big picture view on the region, developing a marketplace to exchange materials	Waste audit data is kept confidential due to competition in the waste management arena.	Improve models for assessing GHGs
<b>6. Different set of categories</b>	Readily getting consistent figures on material consumption (inflows) to assess in relation to info from waste audits (outflows)	Virgin material categories can be different from waste stream categories, e.g. aluminium becomes categorised as 'non-ferrous metal'; high percentage of 'mixed waste'.	Assemble relevant peak bodies from upstream (mfg) and downstream (waste) to work toward common categories (or simpler mapping from one set to another)
<b>7. Not Australian</b>	Accurate estimates based on examples elsewhere when detailed data is missing in this region	Material consumption data is hard to assemble, and estimates from Europe, with more manufacturing, seem inaccurate in Australia, with less mfg.	Analyse examples in an Australian context, rather than extrapolating from European examples
<b>7. Not interested</b>	Businesses taking advantage of opportunities to redesign/reuse/repurpose materials	Even the most interested business leaders had little knowledge of the scale of the challenges and opportunities for the circular economy.	Start small with committed businesses

## 5. City Scan findings

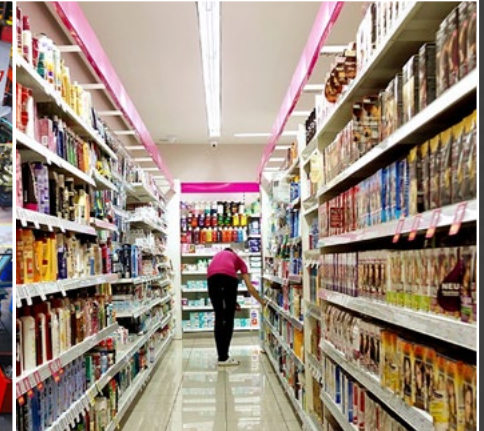
The *City Scan* analysis phase 1 provides insight through the input data for their online tool, which characterises economic strengths of the region alongside data suggesting environmental impacts – material consumption and greenhouse gas emissions.

The *City Scan* tool highlights an array of 25 general ‘circular’ strategies. It assesses the data on the region to recommend a subset of these strategies that seem most likely to reduce waste and greenhouse gas emissions in each of 10 broad industry sectors.

These findings - and associated observations - are summarised in the table, text boxes and diagram that follow.

- Over 70% of greenhouse gas emissions in the region are from the extraction and utilities sector – a share of about 30% for coal mining and about 40% for the four, large, electric power stations. This sector provides about one-fourth of the region’s contribution to the GDP.

- The service sectors in the region rank lowest for greenhouse gas emissions.



**Table 2: Relative environmental and economic impacts by industry sector in this region<sup>2</sup>**

SECTOR	EXAMPLE COMPANIES	EMISSIONS RANK	JOBS RANK	VALUE ADDED RANK	LGAs WHERE SECTOR IS IMPORTANT
Extraction & utilities	Glencore AGL Hunter Water	1	7	1	Lake Mac Singleton Muswellbrook
Manufacturing	Ampcontrol Quarry Mining	2	5	7	Port Stephens Newcastle Lake Mac Central Coast
Trade, transport, accommodation, food services	Coles Port of Newcastle Wests	3	2	4	All LGAs
Agriculture	McGuigan Hunter Belle	4	9	9	Upper Hunter Dungog
Construction	McDonald Jones Downer	5	3	5	Central Coast Maitland
Professional & support services	University of Newcastle Forsythes	6	4	4	Newcastle Lake Mac Central Coast
Social services	HNE Health NDIS	7	1	2	All LGAs
Recreational & other services	Surf Life Saving Port Stephens Koala Sanctuary	8	6	8	Modest in all LGA's
Financial, insurance, real estate	Newcastle Perm NIB Walkom	9	8	3	Newcastle Lake Mac Central Coast
Info, technology & communications	NBN Telstra	10	10	10	Modest in Newcastle Central Coast

## Which sector is 'responsible' for greenhouse gas emissions?

When tracking greenhouse gas emissions in a region by industry sector, the notion of a supply chain is critically important. For example, the use of large amounts of heat in the manufacture of cement make it the single largest source of industrial greenhouse gas emissions on the planet.

Those emissions can be attributed to the manufacturing sector, rather than to the construction sector, where the cement is used in concrete. The construction sector could use less concrete, but they would need to rely on designs created by the professional, research and support services sector. Those buildings are sold or leased by the financial, insurance and real estate services sector. The buildings are then used by all industry sectors.

Buildings are disposed of by demolition companies, which are classified in the 'recreational and other services' sector. Concrete is often ground up by companies in waste management/recycling ('other services' sector) for reuse as aggregate. The equipment used for that grinding up comes from the manufacturing sector. So, each product employed by a consumer or business actually involves a string of enterprises in a supply chain.

## Why to engage with bigger businesses, and smaller ones

Typically in a region, a few larger employers are responsible for significant chunks of value added or for material use or greenhouse gas emissions, or some combination of these factors. Small- to medium- sized businesses (SMEs) are responsible for by far most of the region's employment. This situation suggests that larger reductions in greenhouse gas emissions are likely when governments engage with the larger emitters, the large companies. Long-term strategies around employment, though, are likely better focused on SMEs.

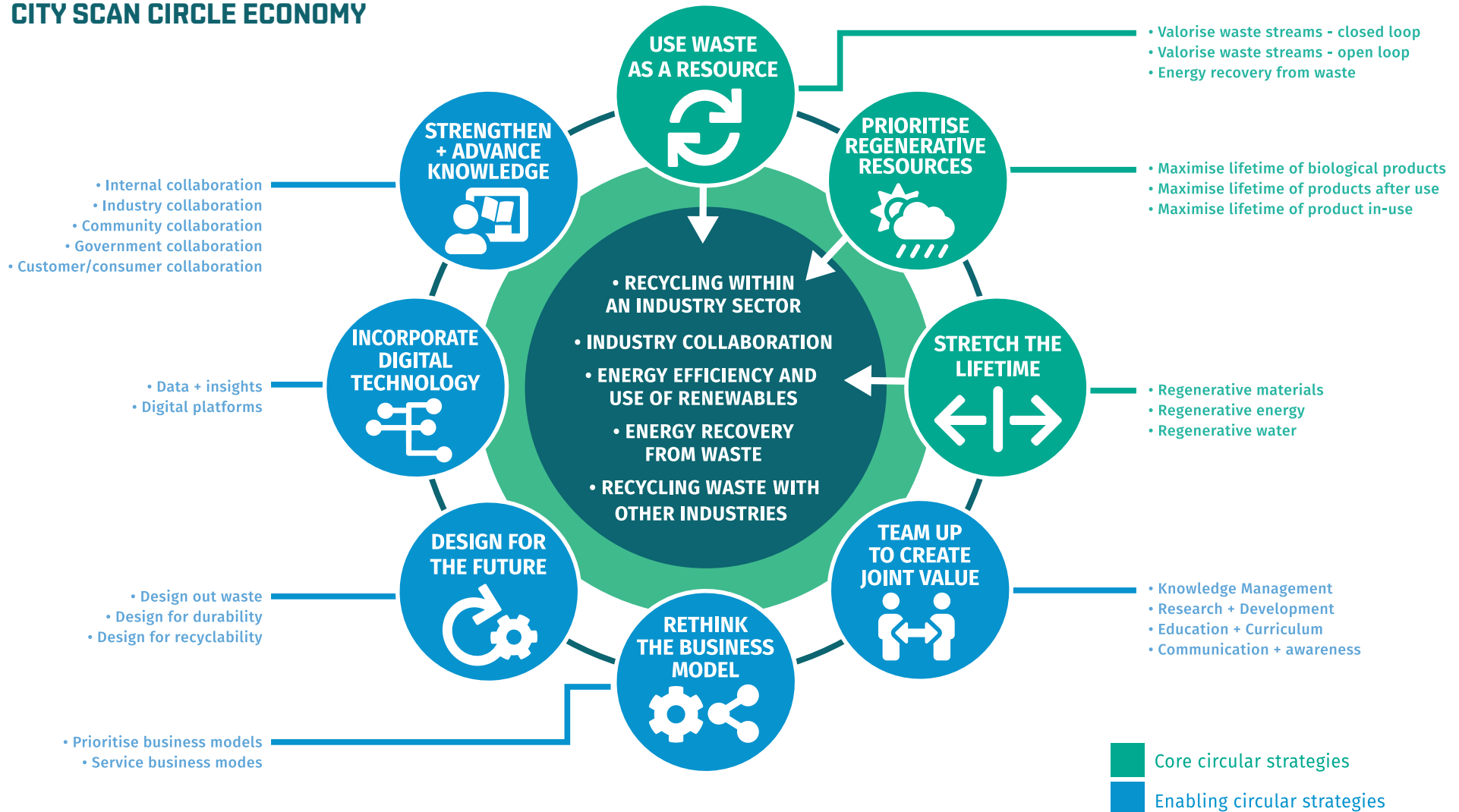
## Businesses increasingly have the relevant data

Most enterprises have a firm handle on the volume of materials, energy and water that they purchase. The level of environmental impact that is generated to produce these inputs is estimated and tracked by a few SMEs. Consultancies and apps are increasingly helping with this estimation, so, the number of manufacturers who can provide this 'carbon footprint' data is growing. Such tracking can be modelled, supported and rewarded by local and state government.



# Circular strategies and priorities recommended for this region by the City Scan tool

## CITY SCAN CIRCLE ECONOMY





## 6. Next Steps

Increased attention to the circular economy in recent years presents a window of opportunity for the Hunter and Central Coast region to attract businesses and grow employment, while reducing material consumption and greenhouse gas emissions toward a target of net zero by 2050.

The *City Scan* phase 1 has helped to identify priorities, such as industry sectors where greenhouse gas emissions and material consumption are high and jobs may be at risk from efforts to decarbonise the NSW economy.

Circular economy initiatives for the Hunter and Central Coast region require singular and collective leadership:

- **Become a national exemplar of regional collaboration in developing the circular economy** – A leadership role in the nation's circular economy provides visibility to attract businesses to the Hunter and Central Coast region with suitable smart specialisation capabilities, thereby developing in the region's circular economy the advantages of 'agglomeration', which will further speed growth.
- **Regional taskforce to build the circular economy** – The needed alignment among various actors in local government, state government and business can be strengthened through ongoing liaison among existing initiatives and departments with agreement on shared agendas and common ways of assessing progress. That argues for a central role and expanded capability for the Hunter and Central Coast circular economy facilitators group.
- **Government policy change** – Necessary changes in government policy and funding can be identified and promoted by this coordinated regional taskforce. Such policies can relate to initiatives such as the sharing of data gathered by government and addressing opportunities that are significant at a state or national level, such as enhancing the reuse of fly ash from the power stations.

### Leadership responsibilities to accelerate the region's circular economy –

1. Collaboration across business, government and community sectors to achieve collective impact
2. A roadmap for the Australian context to close the data gaps that are left by the traditional, take-make-waste economy
3. Policy change to reduce the barriers to sharing data and leveraging that information.

### *Circular economy needs collective impact*

The engagement in this project by multiple organisations from different sectors makes the *City Scan* effort more than a desktop process of collation and analysis of data. It has been a scaffold for aligning activity among an array of players. The effort has been fostering synergies across businesses, non-profits and government bodies who share common goals and aspirations. That is consistent with strategies to achieve 'collective impact'. Collective impact approaches have developed in a number of arenas to strengthen alignment among multiple parties. Employing this synergistic approach is recommended for future steps in building the region's circular economy.



## Take-home messages - progress & challenges

• **Collaboration has started** - Collaboration on accelerating development of the region's circular economy has already started, both for this study and in initiatives already being undertaken by pioneering businesses in the region.

• **Industry sectors in this region at the greatest risk from decarbonisation are evident** - The greatest contribution to greenhouse gas emissions in the region are from the power generation and mining sectors, with 40% and 30% shares respectively, of the total emissions for the region. Then comes manufacturing, followed by trade, transport, accommodation and food services. These sectors may lose jobs as initiatives to reduce emissions take hold.

• **Economic promise** - Modelling of growth in a regional or national circular economy suggests sustaining or growing the number of jobs and economic output. That growth can be understood to reflect use of smart specialisation strategies.

• **A lack of data inhibits** - Data on material consumption and greenhouse gas emissions to date is okay for beginning to set priorities but not for comparing regions or tracking progress.

• **Collaboration needs to be enhanced** - Closing the data gaps and addressing the other points above hinge on the first point: building collaboration across governments, industry sectors and the community at the regional level.

• **Tools are becoming available** - Tool, such as *City Scan*, are increasingly available, but they need to be assessed and tailored to the Australian context and to the regional perspective.

• **Can be hard to distinguish which other sectors can help the most in reducing greenhouse gas emissions** - Assessing scope 1, 2, and 3 greenhouse gas emissions at the regional level and at the level of individual industry sectors has proven problematic. Key questions are about who gets credit for emissions or who has authority to pursue reducing those emissions, e.g., the users or just the generators? How can we make them more accurate at level of region, industry/business, product/process?

• **Local government needs ...** - Local government needs working relationships with local businesses to elicit needed data as well as to confirm circular economy priorities, shift policies and pursue strategies to boost the circular economy.

• **Data gaps fall into 8 categories** - Too little, too much to collect, inaccurate, too complex to follow, commercial in confidence, different sets of categories to track the same material, not tailored to the Australian context, and not all businesses are yet interested in reporting or viewing such data.

## 7. Collaboration to characterise circular economy opportunities

**Many organisations involved** - Accelerating development of the region's circular economy requires extensive cross-sectoral collaboration. As a step in that direction, this *City Scan* analysis engaged with more than 80 organisations in the region from small non-profits to multinational corporations and government departments.

**Core group** - The project's core group of collaborators are Lake Macquarie City Council, the Hunter Joint Organisation, the City of Newcastle, Central Coast Council, the non-profit Go Circular, and the University of Newcastle. Also contributing was the NSW government's Sustainability Advantage and the federal government's Australian Postgraduate Research Intern program.

**International support** - The Netherlands-based consultancy, Circle Economy, played a key role as developer of the *City Scan* approach, and they coached the project team in its application in this region. Circle Economy has gained international prominence for its analysis identifying and characterising gaps that stand in the way of 'circularity'. They have also been creating tools to identify the potential for the circular economy in cities and regions.

**Business input** - Expert insight into sources of data on this region's industries - and into the compatibility of the circular economy with their operations - has been provided by leading regional organisations:

- Emergent Group
- Ampcontrol
- CSIRO
- Dantia
- Hunter Water
- Kumalie Group
- Lake Mac City Council
- Net Modular
- Orica
- Port of Newcastle
- Quarry Mining

**Growing community of interest** - An additional 120 representatives from 79 organisations engaged with the project group at a circular economy 'think tank' on 10 May 2021 as part of the Hunter Innovation Festival. Building such connections into collaboration is essential for expanding circular economy activities in the region. The circular economy is involved in a range of local government functions, business strategies, efforts of the non-profit sector, educational programs, delivery of health services, etc.

**Circular examples highlighted** - Circular economy activities identified during this project include Quarry Mining shredding cardboard boxes to use in place of bubble wrap when shipping the components that they manufacture for underground mining. Orica's production of ammonium nitrate creates a byproduct stream of pure carbon dioxide that satisfies 50 per cent of the market in New South Wales for the carbonation of beverages. Net Modular has for years been disassembling and rehabilitating modular classrooms using a high proportion of the original materials, as sole supplier of demountables for the NSW Department of Education.

**Agreeing on priorities** - These types of circular economy opportunities promise to reduce reliance on landfill, cut down on plastic particles and other chemicals entering the environment, pare back water use, reduce greenhouse gas emissions, and generate jobs in the region. To progress such efforts, thousands of opportunities need to be assessed to identify the top priorities for businesses and governments in order to grow the region's circular economy. Progressing that assessment has been the aim of the *City Scan*, by providing a credible, understandable evidence base to enable multiple parties to agree on where to focus and to foster collaboration on next steps.



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## Endnotes

1 Ellen MacArthur Foundation (2021). Concept. <https://www.ellenmacarthurfoundation.org/circular-economy/concept> – accessed 1 August 2021.

2 This table was assembled by UON based on economic data from the Australian Bureau of Statistics that was aggregated in websites for each council by either REMPLAN or .ID. The greenhouse gas emissions data was estimated based on data derived from a range of sources described in Appendix D of the main report.

## Appendix: Data gaps and how industry can help

**Challenges at the regional scale** - Setting priorities and tracking progress in development of the Hunter and Central Coast's circular economy is hamstrung by a lack of good data at the regional scale. The data available is full of inaccuracies and idiosyncrasies. Conventions employed in the waste sector, for example, are not as useful in the manufacturing sector. Greenhouse gas accounting is also an evolving beast. Challenges are laid out below.

**Employment figures are approximate** – The tally of how many people work in a particular industry in a given LGA can be counted in two ways: (1) based on where they work and (2) based on where they live. The more common convention is that someone who lives in Cessnock and works at the Eraring power station in Lake Macquarie City Council area counts as being employed in the utilities sector in Cessnock LGA. That is rather than counting their employment in the Lake Macquarie LGA. Data on either option is available from the Australian Bureau of Statistics, with the convention among analysts to look at 'place of residence' rather than 'place of employment'.

Figures on employment by industry become less reliable at the level of LGA. The Australian census every five years is a great baseline, but annual updates are estimates based on surveys of a sample of residents and employers. A sample size of 500 workers in an LGA with 50,000 employed residents constitutes 1% of the workforce. That is only 50 survey respondents for each of the 10 industry categories employed by *City Scan*. Furthermore, these figures capture an individual's main source of employment, not second or third jobs.

**Gross value added (GVA) is calculated** – Figures for gross value added essentially represent the contribution to the country's GDP from a particular industry in a particular LGA. These figures follow international conventions for tracking economic value. These conventions are incorporated in the Australian government's national accounts system.

GVA is not actually tracking dollars into bank accounts. Rather, it is using well accepted methods to assess where value is being generated and where it should be evident if the statisticians had access to detailed records of sales and revenues.

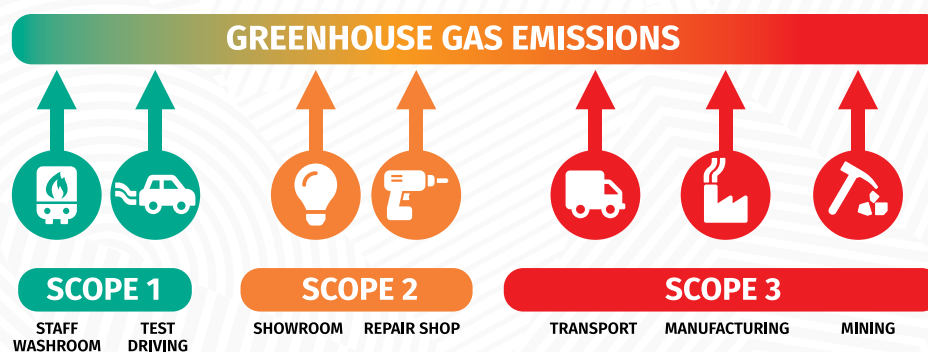
### **Greenhouse gas emissions are rough approximations and incomplete**

– Figures for emissions for each industry sector in each LGA are estimates rather than measurements. They are based on calculations of emissions for a particular type of business or enterprise – *e.g.*, how much electricity or heat or transportation do they use for particular processes? These figures are then multiplied by how much business activity occurs in that industry sector, such as in terms of dollar volume of revenue.

Complicating matters are decisions about which company or which locality gets attribution for those emissions, *i.e.*, scope 1 direct emissions versus scope 2 emissions from purchasing energy (*e.g.*, electricity), versus scope 3 indirect emissions of other sorts from elsewhere in the supply chain.

For example, a car dealer's emissions in scope 1 include emissions from the test driving of new vehicles by prospective buyers and from the gas-fired water heater for the staff washroom. The emissions in scope 2 are for the lights in the showroom and the power tools in the repair shop, as the electricity is generated by the utility, not on site at the dealership. The emissions in scope 3 would be for things like the manufacturing and transport of the cars. The emissions associated with manufacturing – and the mining of raw materials for enable that manufacturing - can be substantial, compared to the energy required to heat water for the staff washroom. So, scope 3 emissions represent a significant consideration.

### **Sources of emissions for a car dealership: example.**



Commonly recognised figures for emissions by LGA for Australia are provided by Ironbark Sustainability on the *Snapshotclimate* website. They employ a formula based on the types of industries in an LGA, areas of employment and other factors.

This formula gives a figure of 4,700 kilotonnes per year of CO<sub>2</sub>-equivalent emissions for the Central Coast. A more detailed assessment by Ironbark Sustainability that was commissioned by Central Coast Council landed on 3,700 kilotonnes per year, a figure that is 27% lower. That illustrates the difference between approximations that are employed for quick comparison across LGAs versus assessments that go into detail on the scale of different industries, with more definition of their scope 2 emissions.

The protocol that Ironbark Sustainability uses for LGAs nationally treats emissions from large electricity generating stations as being the 'responsibility' of every LGA that uses that electricity. That means that the significant emissions of the power stations in Muswellbrook and Lake Macquarie are mainly allocated to the population centres of Sydney as scope 2 emissions.

This allocation represents a policy conundrum. Should the emissions of the power stations be addressed by the local councils in this region or by the councils in Sydney, or both? Further, how will decarbonisation efforts implemented for Sydney affect employment in this sector in the Hunter and Central Coast region? Similar concerns about jurisdiction would arise from considering scope 3 emissions, across supply chains. However, Ironbark Sustainability does not estimate scope 3 emissions for its tally of emissions by Australian LGAs.

For the *City Scan* analysis reported on here, the convention employed by Ironbark Sustainability is not accurate for assessing which industries in the Hunter and Central Coast region might see employment threatened by decarbonisation to reach net zero emissions. To address that employment issue, the emissions figures in the bar chart of economic and emissions input data for the region – the data submitted to the *City Scan* tool - have been adjusted to include the power stations in this region, as scope 1 emissions.

In tables of figures in the main report where emissions for each LGA in the region are compared, the *Snapshotclimate* figures have been

used, which leave out the power stations. These 'less accurate' figures enable comparison among industries that are not the state's power stations.

Scope 1, scope 2 and scope 3 emissions involve looking up and down a supply chain that could stretch from mines in Western Australia to a recycling plant in Mayfield or a landfill receiving tyres in Indonesia. Locating and categorising emissions (scope 1, 2, 3) also suggests what government body or industry should be seen as responsible for limiting those emissions.

This question of which locality 'owns' greenhouse gas emissions from power generation stations illustrates the nature of data challenges. How does a single set of figures for greenhouse gas emissions provide accurate and meaningful evidence to address a range of questions?

**Materials consumption estimates can vary by a factor of 10** – The circular economy is essentially about the use of materials, such as concrete, steel, aluminium, chemicals, paper, and glass. Identifying how much material is used in a region is essential for estimating the economic and the environmental potential of the circular economy, but figures are still quite inexact.

Estimates are made at the national level based on things like the volume of iron ore that is mined nationally and how much is exported. Comparing different methods to scale those figures to the regional level, such as by economic output in the region, has revealed 'answers' that can differ by a factor of 10. That is a big problem and an area in dire need of attention.

The proportions of different types of materials used by each of the 10 industry sectors employed in the *City Scan* tool were calculated based on a model that seems rooted in European examples. That is, Circle Economy derived figures based on international protocols and their own consultancy experience in various European cities and regions. These models led to estimates for the manufacturing sectors in the Hunter and Central Coast to consume high levels of crop residues. While that may be true in cities where the cattle and dairy industries are strong, it is not clear that it is true for a region with a significant amount of manufacturing of steel components for the mining industry.

The level of uncertainty in these estimations is such that it is not possible to tally for a given year how much wood enters the region, how much is residing

in the region in the form of furniture, fenceposts and wooden pallets, and what percentage of that stockpile is going to recycling or landfill. In other words, there is no accurate mass balance across the range of materials and array of industry sectors. A mass balance enables assuring that the figures are correct – it is a form of triangulation. A firm grasp on data for material consumption and waste flows also informs the marketplace. The market determines the cost of virgin materials versus the cost of used materials and the likely return on investment for finding ways to reuse those materials.

Figures on the tonnage of various types of material in the waste stream and in recycling are available from various sources, but the sources are not always public nor always accurate. Some data is kept by landfill facilities, some by companies that collect waste or recycling, and some by consultancies that audit the stream of ‘general/mixed waste’ for councils. Certain data that is reported to the NSW government to enable assessing the tonnage of glass going to landfills, for example, is not reported publicly at the granularity of LGA. This secrecy is in recognition of competitive pressures among waste management companies.

Complicating matters a bit is that materials identified in the waste stream tend to be classified a bit differently to materials consumed in manufacturing and services. For example, mattresses are identified as a single category in some waste stream data, where the materials seen to be ‘consumed’ are metal (springs), crops or chemicals (fabric) and chemical products (foam).

Despite such challenges, the ‘rubbery’ figures for material consumption can be combined with available figures for the tonnages of materials going to landfill and into recycling for a given LGA to assemble a ‘material flow analysis’. Ideally, the tonnage of material entering a region is equal to the tonnage retained in products, such as the amount of aluminium in window frames in buildings in the region, and the amount that is exported or goes into the waste stream. This ‘mass balance’ is not yet possible at the regional level in Australia, as noted just above.

This inability to achieve a ‘mass balance’ may be why the tonnage of materials in the waste stream for the region, broken down by industry sector, is not required as an input for the *City Scan* tool. Circle Economy appear to have allocated greater importance to having analysts for each region, such as the team for this project, obtain data on material consumption.

There are questions about which industry sector should be credited with consumption of a particular material. For example, if a local government commissions building a roadway, is the use of the aggregate involved credited to ‘public administration’ or to ‘construction’ or to ‘transport’?

**State of the art** – Consistently high-resolution, credible figures at the level of LGA and industry sector can be obtained for economic data. It is important to gain access to similarly reliable figures on material consumption and greenhouse gas emissions. High resolution data – at the level of region or LGA for each industry sector or subsector - is required from manufacturers, distributors, retailers and service providers in a way that is economically, logistically and politically feasible.

For tallies of this data, categories need to be kept consistent across material consumption, use of products during their lifetime, and the waste and recycling stream. This supply chain and use process usually involves multiple industry sectors, which makes breakdowns of material consumption or greenhouse gas emissions by industry problematic.

This lack of resolution of how much of what is being used by whom can make it hard to identify the best leverage point for reducing use of materials, extending their lifetimes or limiting greenhouse gas emissions.

Solutions to these challenges involve building working relationships between those in industry who consume materials and produce goods and services and those in government who have the capacity to request, aggregate and share data.

**Boost working relationships** - The data challenges are daunting, but they can be addressed over time through increased understanding of the use of materials and energy along supply chains involving specific industry subsectors. That understanding can be shared more effectively between businesses and the local, state and federal governments who regulate them, purchase from them and provide services for them. Shared understanding and sharing of data can result from enhancing cross-sectoral working relationships.

Both industry data and the working relationships with industry sectors are needed by local governments to identify where they have the most leverage in reducing material consumption and greenhouse gas emissions in the region.

**Insights from industry and sustainability experts** - Advice on improving data from industry came from interviews of 16 experienced business leaders, sustainability specialists and government staff in the Hunter and Central Coast region.

Key points that emerged include the need to be clear about the aims for gathering data given the time and effort involved in recording, reporting, collating and analysing data. It was also stated that there is a need to provide confidence in the data, with credible baseline or trendline figures and a regional scope, as that is a relevant scale for the circular economy. An index of 'circularity' for the region and for particular industry sectors was also identified as a need.

Where the circular economy requires new technology, such as to disassemble used electronic goods, technology-readiness ratings were recommended. Case studies of individual firms and industries undertaking circular economy initiatives were requested, as well.

A governance framework for data collection, storage, use and presentation was characterised as important. The types of data portrayed as necessary included the location of materials to be reused and times of year when they are plentiful, the sustainability of such resource stocks, the expected lifetime of a material when it is in use and its market value.

Environmental data was also described – volume of materials diverted from landfill, water use, greenhouse gas emissions, energy use, renewable energy generated and kilometres travelled. Any sort of circular economy assessment for the region, it was noted, could be put in context with general indicators, such as population, housing prices, job market, air and water quality, and weather.

Staff in local government involved in this *City Scan* project have discussed whether such reporting can be made a requirement in procurement contracts with local governments. For example, a potential supplier such as Officeworks

would need to bid to provide stationery supplies with a promise to report on how much paper, steel and glass are in the products that they deliver to a given council each year.

The interviews confirmed the obvious, that an array of data is collected on a firm-by-firm basis. However, commercial competition among firms may inhibit some from reporting. Such data is not comprehensive nor necessarily broken down with sufficient granularity (e.g., differentiating one type of ferrous metal from another). A big step forward was offered - establishing a tradition and protocols for reporting material consumption, essentially establishing a community of practice for such reporting.

Sustainability specialists interviewed for this study suggest that larger companies report on greenhouse gas emissions each year to shareholders, international investment providers and governments. Having those estimates broken down by site, i.e., for facilities in the Hunter and Central Coast region, would be useful. Incentives for sharing such local data might be required, as each organisation needs to commit staff time to gathering and collating data. Additionally, local governments must build trust by assuring that such data will be well used for analysis and initiatives that benefit residents and businesses in the region.

**DATA AVAILABILITY**

	EMPLOYMENT	VALUE ADDED	* EMISSIONS	** MATERIAL CONSUMPTION
LGA	✓	✓	✓	✗
REGIONAL/ STATE	✓	✓	✓	✗
NATIONAL	✓	✓	✓	✓

\* clarify scope 2, scope 3 emissions  
 \*\* track from input to waste/recycling



